ANCIENT RACES OF INDIA & PAKISTAN—A STUDY OF METHODS[1]

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CONTENTS

1. INTRODUCTION

THE AIM OF ARCHAEOLOGICAL EXCAVATIONS IS TO LOOK FOR, DESCRIBE AND IDENTIFY the past culture of a given area. After this primary work is done comes the job of postulating the origin and connexions of the culture on the basis of the objects prepared and used by the forgotten authors of the culture. Therefore, even after much

[1] Presidential Address to the Anthropology and Archaeology Section of the combined Fiftyfirst and Fiftysecond Sessions of the Indian Science Congress, Calcutta, 1964-65.

is known about the culture, there still remains the question of the people themselves, their characteristic physical features and their affiliations with past, contemporary and recent groups. Without such knowledge the account of any past culture would remain incomplete. Herein lies the importance of skeletal remains from archaeological sites. The work of interpreting such material is usually the responsibility of the physical anthropologist who is the specialist in the field. It is, therefore, quite logical that there is the scope of close co-operation between the archaeologist and physical anthropologist, and I am happy to note that a co-ordinated approach is quite evident in India, as it is anywhere else in the world today.

In the present paper I have made an attempt to review the work of anthropologists on the skeletal remains which have been excavated during the course of several years of painstaking work at different sites in India and Pakistan.

The object of this review is methodological in nature. I have tried to show that the interpretations hitherto made of the skeletal materials found in our sub-continent have been based on erroneous and outmoded concepts of race and that, therefore, these interpretations cannot be accepted as valid. I have next tried to show what would be achieved by a more rigorous application of a scientific concept, based on population-genetics. The application of this concept has brought in far-reaching repercussions in animal-taxonomy and is forcing the anthropologist to rethink on human taxonomy as well.

An anthropologist has to work under some limitations. He tries to trace inter-relationship among living races by taking numerous measurements on the bodies of individuals. From these measurements proportions between any two parts of the body are calculated into indices. The proportions of these indices in a population are expressed as percentages. In addition to the measurements of the body-parts and their proportions, the characteristics of various soft parts, such as colour and form of the hair, colour of the skin and pupils, shape and other characteristics of the eye, nose, lips, etc., are also studied. Recently, many of the physiological and biochemical properties of blood and other body-fluids have also been taken into account. But most of these are not applicable to human remains unearthed by the archaeologist. Moreover, such skeletal remains are more often than not broken or distorted out of shape. Even if the remains are perfect, the anthropologist has no means by which he can reconstruct the form of the soft parts or the nature of pigmentation of skin, eyes and hair. Naturally, under these circumstances, our inferences on the affinities of people represented by the skeletal remains will be very tentative and of limited value.

All interpretations are based on some concept or other. At a given time one concept may be popular, while another may be so at some other time. These changes in concept generally depend on the availability of further facts and the increase in our knowledge of the nature of things. For example, Linnaeus conceived species as static and eternal. But gradually a notion of mutability of species was taken for granted. Yet, Lamarck looked at the phenomenon in one way, and later on Darwin, on a very much larger amount of data, interpreted it in a different way. Still later, when genetics was rediscovered, it provided an even different way of looking at things and contributed far-reaching changes in Darwin's concept of the evolutionary mechanism. This necessity of the changes of concepts is true in every branch of science.

Physical anthropology deals primarily with the phenomena of evolution and differentiation of man as an animal-species. As such, the methods of classification and interpretation will be identical with those employed in animal-systematics or -taxonomy.

Central to these categories is the concept of species. Since man achieved the status of a species at a remote period of time, the question of the status of human skeletal remains found in India up to the present in the various archaeological fields does not arise. However, the correct infra-specific categorization of the material is vitally relevant to us. Any meaningful interpretation of the skeletal finds, therefore, must conform to the concepts pertaining to the infra-specific groupings as held by the modern authorities on the subject.

I shall begin the review by summarizing the published accounts on the skeletal remains excavated from various sites in the Indo-Pakistan sub-continent.

2. MATERIAL FROM DIFFERENT SITES

A. Sialkot and Bayana

The earliest reference to ancient skeletal remains in India is by Sir Arthur Keith who described two skulls referred to as 'Sialkot' (Panjab, Pakistan) and 'Bayana' (Rajasthan) respectively.[1] After examining the two skulls in detail, Keith came to the conclusion that both represented the Mediterranean race. Sewell and Guha, on the other hand, considered only one of them (Sialkot) as belonging to the Mediterranean stock, 'but the Bayana cranium has a lower vault and a higher bregma-index, which may indicate a certain degree of admixture of the Mediterranean with some other type.'[2]

B. Raigir

Hunt reported on six skulls from some cairns of uncertain age which he excavated at Raigir, Hyderabad.[3] He does not mention the racial affiliation of the individuals represented by the skulls.

C. Nal

The human bones, mostly fragmentary, found at Nal, Baluchistan, were handed over to Sewell and Guha of the Zoological Survey of India, who maintained that the bone-remains belonged to thirteen individuals, of which seven were probably adults.[4] Only one skull existed among the bones received by them, and the report is based on this single skull, which was not in good condition and had 'undergone slight deformation'. Even then, the most important measurements (maximum frontal diameter, bizygomatic breadth and intermalar breadth) on it were taken; these measurements were, therefore, more or less guesses. In spite of the defects in the skull, the authors had 'no hesitation' in assigning the individual whose skull was examined to the Mediterranean race. Incidentally, skulls of varying indices have been found at Kish; but among them only those with lower indices were selected and it was with them that the Nal skull, which had also a low

[1] Arthur Keith, 'Bayana and Sialkot', *Journal of the Anthropological Society of Bombay*, XI, no. 6 (1917), pp. 663-72.

[2] R. B. Seymour Sewell and B. S. Guha in H. Hargreaves, *Excavations in Baluchistan 1925, Sampur Mound, Mastung and Nāl*, Mem. Arch. Surv. Ind., no. 35 (1929), pp. 56-86.

[3] E. H. Hunt, 'Hyderabad cairn burials and their significance', *Journal of the Royal Anthropological Institute of Great Britain and Ireland*, LIV (1924), pp. 140-56.

[4] R. B. Seymour Sewell and B. S. Guha in H. Hargreaves, *op. cit.*, pp. 56-86.

index, was compared, the other skulls from the same site being excluded presumable as irrelevant in the context.

D. Makran

Two skulls found in Makran, Baluchistan, were examined by Sewell and Guha. Their report shows that both the skulls were badly broken and distorted so that not many measurements could be taken.[1] No photographs accompany the report, and hence we cannot even guess the extent of the damage. However, although no measurement of the skull-cap could be taken, the authors felt that both skulls were dolichocephalic and at least Skull B appeared to have possessed a high vault 'very similar to that of the "Nal" cranium'. The authors further note: 'While agreeing with "Nal" skull in its general type Skull B would appear to show traces of mixed origin and in certain respects tends to approximate to the Caspian or Nordic Type of skull.'

E. Mohenjo-daro

The skeletal remains from Mohenjo-daro, West Pakistan, were excavated in more than one operation. The larger lot, found in the first operation, was published by Sewell and Guha.[2] From the remains of about twentysix individuals the authors selected fourteen as being in good condition.

Although these skulls were selected from among a larger number because of the relatively better state of their preservation, the authors draw our attention to the fact that these were 'not too greatly damaged to render reconstruction impossible, and from these to take measurements of a more or less reliable character and draw deductions from them. It must, however, be borne in mind that some of these skulls have undergone a certain amount of posthumous deformation owing to the pressure of the superincumbent earth, and this process has probably also been assisted by the deterioration of that part of the skull that lay below.'[3] Tables are provided showing these measurements which reveal a remarkable feature: the individual measurements of all the skulls, whether male, female or child, have been lumped together in order to calculate the average of the group—this being a method which is never applied by any anthropologist to living subjects and is contrary to the accepted practice.

The well-known thesis of the presence of multiple races in the population of Mohenjo-daro is based on the first group of fourteen skulls described by Sewell and Guha. They claim to have indentified four 'racial types' amongst eleven of the fourteen skulls of men, women and children. Thus, the first type isolated by them is Proto-Australoid. The particular characteristics, or the scoring criteria, are present in three skulls, all belonging to males. The second type allegedly belongs to the Mediterranean race, identifiable in skulls belonging to four females and two males. The characters of the Mongoloid race are said to be found on only one skull; and another single skull, this time that of a child, has been considered sufficient to establish the Alpine racial identity of its owner. Thus, the eleven individuals are very neatly pigeon-holed into one or the other great racial stocks, excepting the Negroid races.

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[1] R. B. Seymour Sewell and B. S. Guha in Aurel Stein, *An Archaeological Tour in Gedrosia*, Mem. Arch. Surv. Ind., no. 43 (1931), pp. 191-200.

[2] R. B. Seymour Sewell and B. S. Guha in John Marshall, *Mohenjo-daro and the Indus Civilization* (London, 1931), II, pp. 599-648.

[3] *Ibid.*, pp. 606-07.

The second operation at Mohenjo-daro produced the remains of fifteen individuals, all presumably the victims of marauding raiders. Guha and Bose analysed only six of them.[1] Though the condition of the skulls was far from perfect, the authors tried to establish the 'racial affinities' of the people presented by the skeletal remains. In this effort, they took into consideration not only those skulls the measurements of which (mostly partial) are given in the tables, but also broken skull-pieces which appeared to suit their purpose. Thus, they assembled the skulls in two groups, A and B. After describing the two groups separately, they had no hesitation in affiliating the two persons represented by Group A skulls to the Proto-Australoid race and those represented by Group B skulls to the Mediterranean race. They also found evidence of admixture between the two races in one skull (M. 28), provisionally put in Group A. In their opinion, 'the presence of a high-pitched, narrow nose in M. 28, instead of the broad, flat nose of M. 11 [of the first operation] and other Mohenjo-daro A skulls [also of the same operation], may not improbably indicate, if anything, that both the races had been mixing their blood for a considerable time and individuals possessing different combinations of characters were not uncommon in that city'. In view of this statement, it is not immediately understandable why no skulls were classified as belonging to the intermediate classes among the fourteen skulls excavated in the first operation. In the analysis of those skulls, it had appeared that the fourteen persons belonged to four clear-cut races, and there was no sign of any intermixture among them. Finally, Guha and Bose were convinced that the structure of the forehead is indicative of intellect in the skulls of *Homo sapiens*. They remark: 'In Mohenjo-daro B skulls, on the other hand, the lack of great physical strength seems to have been compensated by the possession of a superior intellect as judged from the development of the frontal regions. If, therefore, brain rather than brawn be the real test of a ruler, the role of leadership must be assigned to the latter and not to the Mohenjo-daro A people.'[2] One can, however, hardly agree with the authors in this observation, which would appear to belong more to the art of phrenology than to scientific concepts of anthropology.

F. Chanhu-daro

A single skull was discovered at Chanhu-daro, West Pakistan, by Mackay in 1935-36. The skull described by Krogman and Sassaman,[3] was in a sufficiently good condition to permit a large number of measurements on the skull-cap and the face. The authors interpreted the characteristics on the skull as due to combination of the features of the Negroid and Proto-Mediterranean, with a suggestion of Eastern Asiatic (Mongoloid). This association of characters of several races in a single skull seems to have puzzled the authors, but they tried to solve the puzzle by postulating the hypothesis that originally the Negroid and the Proto-Mediterranean came from the same stock and that subsequently in Europe, 'the latter features were bred out to leave a purely Caucasic Mediterranean type'[4] and were geographically separated. The skull was thought to represent a final phase in the Harappa period, when the two types were recombined to simulate an earlier form. And all this speculation, it must be borne in mind, is based on

[1] B. S. Guha and P. C. Basu in E. J. H. Mackay, *Further Excavations at Mohenjo-daro* (Delhi, 1938), II, pp. 613-38.

[2] *Ibid.*, p. 632.

[3] W. M. Krogman and W. H. Sassaman in E. J. H. Mackay, *Chanhu-daro Excavations, 1935-36* (New Haven, 1943), pp. 252-64.

[4] *Ibid.*, p. 263.

a single skull. It is interesting further to note that the skull had enough features to rank it easily within the Mongoloid group. But the authors weighed this point and rejected the Mongoloid affinities and attributed these characters to individual variation. It may be recalled that Guha, with far less evidence in hand, had considered one of the fourteen skulls from Mohenjo-daro as Mongoloid.

G. Langhnaj

Four much-distorted and broken skulls excavated at Langhnaj, Gujarat, were described by Sankalia and Karve in 1949.[1] The skulls were so much out of shape that hardly any reliable measurements could be taken. In spite of this deficiency, the authors mainly depended on visual impressions and relegated them to represent a primitive *Homo sapiens* generally. What they understand by 'primitive' in this context is not specified. Moreover, on the basis of one skull, which had a 'slight prognathism' and showed a 'smooth, small, rounded forehead', they identified this 'primitive' element as Negroid. Later on, Guha re-examined the material and assigned a Proto-Australoid racial status to the individuals represented by it.[2]

H. The Dharmarājikā Stūpa, Taxila

The report on the remains from the Dharmarājikā Stūpa, Taxila, West Pakistan, was published in 1951 by Guha, Sarkar and Bose, all members of the Anthropological Survey of India.[3] Numerous measurements were taken of five skulls and of other bones. None of the five skulls was complete and all the measurements could not be taken in any. Also, judging from the published illustrations, all the skulls were more or less distorted. However, the authors maintained that each of the four skulls had a large brain, long head and face and prominent narrow nose. The fifth one was considered as belonging to an 'essential brachycephalic race' with a high cranial vault; as its facial part was extremely damaged, no opinion could be formed about the structure of the nose or the form of the face. Nevertheless, the authors were definite that the nose must have been long and prominent and the face of a short squarish type. After comparing the individual skulls with those from Mohenjo-daro and other places in and outside India, the authors came to the conclusion that there were two races recognizable among the skulls, neither of which showed much affiliation with the earlier skulls of Mohenjo-daro. They further stated: 'We have not been able to find their exact racial counterpart in the older races of the Indus valley, but from the somatic characters of some of the isolated tribes of the Hindu Kush Mountains, such as the Red Kaffirs... the Taxila monks appear to be closely allied to them...'.[4] The characteristics of the fifth skull were found to be so unique

[1] H. D. Sankalia and I. Karve, 'Early primitive microlithic culture and people of Gujarat', *American Anthropologist*, 51, no. 1 (1949), pp. 28-34.

[2] B. S. Guha and A. K. Mitra, 'Progress of Anthropology in India since 1938', *Mankind Quarterly*, 2, no. 2 (1961), pp. 107-19. [The material has been re-examined recently, Sophie Erhardt and Kenneth A. R. Kennedy, *Excavations at Langhnaj*, pt. iii, *The Human Remains* (Poona, 1965). The conclusion is: 'According to the interpretation from the available material the Langhnaj skeletons mainly indicate traits which are characteristic for Mediterranids and Veddids, but which could also include other races.'—Ed.]

[3] B. S. Guha, S. S. Sarkar and H. K. Bose in John Marshall, *Taxila* (Cambridge, 1951), I, pp. 296-314.

[4] *Ibid.*, p. 314.

that no parallel could be sought among either the ancient Indian skulls or the modern population in India. However, after much search in the available literature the authors could at length find similarities with skulls from the Tarim basin, which, according to them, happened to have been the supposed homeland of the White Huns, the destroyers of the city of Taxila. Therefore, they concluded the skull must have belonged to a White Hun who came to destroy the monasteries when one of them was slain there, and the bodies of the slayer and the slain rested there for thirteen hundred years for the spade of the modern archaeologist. It appears that in spite of the paucity of material, the anthropologists dared draw inferences which were beyond the capacity of the archaeologists.

I. Brahmagiri

Most of the skulls from Brahmagiri, Mysore, according to Sarkar, who examined them, were in a damaged condition and had undergone considerable distortion.[1] After a thorough examination of eight skulls in varying stages of deformity, Sarkar concluded that four of them belonged to the Scytho-Iranian stock, being somewhat similar in their cranial indices to those found at Sialk. He further states: 'This is also borne out by the very close similarity of the Brahmagiri skull B with that published by Vallois in his plate C, fig. 5.[2] Although the former skull belongs to a male and the latter to a female, the similarities are very much apparent in the cranial contour *excepting the frontal region.*' He considered the remaining skulls as belonging to an autochthonous race of Proto-Australoid stock.

J. Yelleswaram

Of the six skulls found at Yelleswaram, Andhra Pradesh, three belonged to males and three to females. All the male skulls had broad heads. The authors, Gupta and Dutta, were of the opinion that these male skulls, at least, showed similarities with those at Sialk and, therefore, presumably belonged to the same stock, viz. the Scytho-Iranian,[3] thus closely following the conclusion drawn by Sarkar on his Brahmagiri material.

K. Piklihal

Ayer described two skulls found associated with neolithic remains at Piklihal, Andhra Pradesh.[4] The skulls appeared to be of robust construction and were large-headed. An admirable description of the skulls and other associated bones was given by the author, but he refrained from drawing extensive racial affinities as is the practice in such cases; he, however, invited the reader's attention to the fact that such skulls were not rare among the modern Tamil-speaking population of the area and concluded that the people 'could be the ancestors of a major element of the present mixed so-called Dravidian inhabitants of the Deccan and Southern India.'[5]

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[1] S. S. Sarkar, 'Human skeletal remains from Brahmagiri', *Bulletin of the Department of Anthropology*, IX (1960), pp. 5-26.

[2] H. V. Vallois, *Les Ossements Humains de Sialk* (Paris, 1940), pp. 114-92.

[3] P. Gupta and P. C. Dutta, 'Human remains excavated from the megaliths at Yelleswaram', *Man in India*, 42, no. 1 (1962), pp. 19-34.

[4] A. A. Ayer in F. R. Allchin, *Piklihal Excavations* (Hyderabad, 1960), pp. 143-54.

[5] *Ibid.*, p. 154.

L. Nevasa

Sophie Erhardt reported on a skull and some other skeletal material from Nevasa, Madhya Pradesh.[1] The skull was described fully, and the author demonstrated a close similarity of the skull with those of the 'primitive' people of the jungle of Deccan.

M. Harappa

Gupta, Dutta and Basu have produced an excellent volume[2] containing much technical information on the human bones found mainly at two sites at Harappa, viz. R 37, considered to belong to the earlier (Harappa) culture, and Cemetery H, a cemetery-site, of a later date. Two smaller collections had also been made from Mound AB and Area G respectively. In all, over eighty skulls were subjected to a very rigorous description and measurement. The general conclusion may be given in the authors' own words: 'In sum, the popluation of mature Harappa culture (Cemetery R 37) was long-headed of which one type was tall, rugged and sturdily built, having pronounced eye-brow ridges, receding forehead, broad nose with depressed roots (Type A); and the other was gracile, comparatively shorter, finer and weaker Type (A_1). In a narrow trench at Area G some round-headed crania (Type B_1) were found huddled together with the long-headed gracile type (Type A_1). At Cemetery H Stratum II, skeletons similar to mature Harappan culture (Cemetery R 37) were discovered (Type A and Type A_1) in addition to a rather tall, large-and round-headed type (Type B_2). In Stratum I, besides the long-headed and round-headed peoples (Type A, Type A_1 and Type B_2), another rather medium statured small-and medium-headed, low-faced people (Type A_2; females only) was found.'[3]

N. Adichanallur

Partial reports on the Adichanallur skulls had been earlier published; but recently Chatterjee and Gupta made a comprehensive survey of the material.[4] Altogether thirteen skulls were considered, of which eight appeared to be male and the remaining ones female. The skulls were much broken and distorted, and most measurements were taken on reconstructed specimens. The authors were convinced that the present series of skulls had resemblances with both the Mediterranean and the Proto-Australoid as the Veddid types. Further, since skulls could not be neatly classified into either group but found place in both, they did not represent a homogeneous population and must be thought of as a group produced by a mixture of the two. According to them, the present-day Dravidian-speakers are the progenies of just this kind of mixture in the past. This conclusion, they maintained, is strengthened by the findings of the microlithic material in Gujarat, the skull at Bayana, and similar finds at Mohenjo-daro and Harappa, testifying to the presence of these two types in the ancient populations of India.

[1] Sophie Erhardt in H. D. Sankalia and others, *From History to Pre-history at Nevasa (1954-56)* (Poona, 1960), pp. 506-22.

[2] P. Gupta, P. C. Dutta and A. Basu, *Human Skeletal Remains from Harappa*, Memoirs of the Anthropological Survey of India, no. 9 (Calcutta, 1962).

[3] *Ibid.*, p. 177.

[4] B. K. Chatterjee and P. Gupta, *Report on the Addittanalur Skulls* (Calcutta, 1963).

O. Maski

Besides the published reports mentioned above, there are some others ready for publication in the custody of the Director of the Anthropological Survey of India, with whose permission they are being utilized here. In the first of these unpublished reports, S. S. Sarkar has considered about eighteen skulls from Maski, Mysore. All of them were badly broken and so much deformed that there was not a single one among the whole lot on which the usual set of measurements could be taken. The author, therefore, had to depend mainly on observational characters in order to trace the racial affinities of the people represented by the skulls but has managed to isolate three racial types from this very unsatisfactory material. These are, according to him (i) meso-brachy-cranic type (Scytho-Iranian?), (ii) a type 'represented by very long head, thick and heavy bones, longer cranial capacity, which, however, could not be measured in any skull...' This type appears to be similar to the al 'Ubaid type', and (iii) a type which seems to be similar to the autochthonous Australoid of this country.

P. Lothal

The unpublished report on Lothal, Gujarat, also by S. S. Sarkar, is based on nine skulls. All of them were very much broken and out of shape, so that all measurements and indices could be only approximate. The skulls have been grouped by the author at the outset into two groups—one having low indices and the other high indices. According to the author, there is a close similarity in certain features of both these groups of skulls with similar groups obtained by Vallois on the crania discovered at Sialk. Sarkar sees in it proof of the identity of types. In the case of Sialk, Vallois named these types Aryan and Armenoid respectively;[1] and by implication Sarkar also agrees to name his types at Lothal in the same manner. He, however, finds that while his Aryan type is pure, his Armenoid type is not so. It is necessary, therefore, argues Sarkar, that one must postulate a hybridization of the Armenoid with the Australoids, the latter represented by flat-nosed and shorter-faced primitive tribes of south India today. It appears that Sarkar's conclusion in identifying Aryan skeletal remains at Lothal in the late Harappa period fits in admirably with the hypothesis that the Harappa culture was destroyed by Aryan invasion towards the middle of the second millennium B.C. It may be mentioned that this is the first occasion in India when an anthropologist has identified prehistoric skulls that belonged to the Aryans; the term was long held to refer to a language-family and, therefore, not a suitable term for racial nomenclature.

Q. Ujjain

The last unpublished report is that prepared by P. Gupta, A. Basu and Anima Roy on the skeletal remains found at Ujjain, Madhya Pradesh. Altogether eighteen skulls have been considered for the report. The skulls were found to be in good condition and of fairly appropriate shape and also to be very homogeneous, so that the authors consider these as belonging to a single type comprising mainly of long-headed but somewhat broad-nosed individuals. The male and female skulls were strikingly similar in form. The mean values of the male skulls are similar to some modern Rajput and Punjabi skulls except in the form of the nose. The authors conclude that the population represented by the skulls may be classified with 'Indo-Aryan' in Risley's classification.

[1] Vallois, *op. cit.*

3. OBSERVATIONS ON THE PREVAILING METHOD

I have made an attempt in the preceding pages to summarize the salient points in the work of anthropologists on the racial affinities of the peoples of the past based on ancient skeletal material from India. I have particularly tried to bring out the sizes of the samples and the condition of the skull at each site so that the conclusions of the respective authors arrived at in each case can be judged. I may now examine the method followed in arriving at these conclusions and the conclusions themselves.

It will be noticed that almost all the authors referred to above have been bound by a single concept concerning the nature of ' race '. At the core of this concept lies the idea that the human species may be neatly sub-divided into a finite number of categories called ' races ' which are subject to clear-cut differentiation. These races are thought to occur in nature in a hierarchical sequence—a large agglomeration of people sub-divided into smaller units and each of the latter further sub-divided into a still smaller one. According to this traditional method, we need only a few broad characters to designate the large category; but as we come down the taxonomic ladder, we are supposed to use more and more characters in an assemblage in order to identify them.

These categories, whether large or small, are always traditionally named. But there is a considerable amount of controversy on the correct name that should be applied to each category. Thus, quite early, in 1776, Blumenback divided all mankind into five races, each circumscribed by geography: Caucasian, Mongolian, Ethiopian, American and Malay. He did not attempt to sub-divide these categories. Huxley, in 1870, classified world-population into the same five primary races: Negroid, Australoid, Mongoloid, Xanthocroid and Melanocroid. It is to be noticed here that the names do not designate any people of a particular geographic area, the suffix *oid* meaning ' like '. Each of them is again sub-divided. Thus, in Huxley's first race, Negroid, are included peoples both from Africa (Bushmen, Negro) and Melanesia (Papuan) which have been categorized as secondary races or modifications. Similarly, his second race, Australoid, includes the sub-races Australian, black races of the Deccan (Dravidian) and Ethiopian (Hamite). The third primary race, Mongoloid, includes five sub-races, Mongol, Polynesian, American, Eskimo and Malay. The fourth, Xanthocroid, based on skin-colour, consists of the white people of northern Europe, and the fifth and last, Melanocroid, includes the dark people of southern Europe and of Asia (Arabs, Afghan, Hindus, etc.). Thus, Huxley proposed five primary races with fourteen sub-races.

Next, Deniker sorted out six primary groups, but they are simply defined but not named.[1] Thus, his six groups are characterized as follows: (i) woolly hair and broad nose, (ii) curly or wavy hair, (iii) wavy brown or black hair and dark eyes, (iv) fair or straight hair and light eyes, (v) straight or wavy hair and black eyes, and (vi) straight hair. Included in these six primary groups are twentynine races and twentytwo sub-races, i.e. fiftyone in all.

The classification of man achieved much greater refinement at the hands of Hooton, who conceived three primary races: White, Negroid and Mongoloid.[2] Each race was conceived of as an original stock of man, of absolute purity. Eventually, each race was split up into several secondary sub-races, which, in turn, were divided sometimes into morphological types. These were all considered to be ' pure races '.

[1] J. Deniker, *The Races of Man* (London, 1900).
[2] E. A. Hooton, *Up from the Ape* (New York, 1956), pp. 423-661.

Besides the classifications mentioned above, many other authors have proposed the same in slightly different ways, emphasizing particular aspects of characters in which each was interested. But one attitude is common to all—that of looking at the phenomenon of race as synonymous with an abstract 'type'. We have seen that almost all the authors who interpreted the skeletal material in India have also apparently adhered to this conception. Thus, they have put the ancient skulls in one or the other types, like Negroid, Proto-Australoid, Australoid, Proto-Mediterranean, Mediterranean, Nordic, Alpine, Scytho-Iranian, and sometimes in categories believed to be intermediate between any two of these. In most cases such methods have produced results which have agreed very well with those of supposed archaeological findings from the respective site.

The procedure of 'typing'-practices has been very simple. Before analysing a sample of skulls (or living beings), the investigator is required to recall the types of the various 'races' which are likely to be involved in the formation of the sample. It must be understood that these races are all thought to be of utmost purity. The 'type'-characters are set arbitrarily, even though fairly long ago Coon stated that very few individuals conformed to the ideal type in the individuals of a given 'race'.[1] Stibbe gave the 'type' of Mongoloid skull the following characteristics: skull, often rather short, the maximum cranial length being rather under 190 mm., and the breadth of quite an average dimension, being from 140 mm. to 145 mm.; cephalic index, 80 and over, moderate brachycephaly; height, good, the average basibregmatic height being 140 mm. and the height-index being 77·5 to 80·0; face, tending to be broad, both in bizygomatic and bimaxillary diameters and without prognathism; eye-socket, as broad as it is high; and bridge of the nose, low and very wide between the orbits.[2] Now, this is an ideal 'type'. Nobody knows how the 'type'-characteristics were found. No mention is made of the variability of the traits, only arbitrary values being fixed. Obviously, these descriptions do not represent the characteristics of a sample, but those of a single skull, expressed as a sum total of a number of characters. Individuals carrying these traits together will certainly be very few as compared with the overwhelming majority of the population. Thus, this fact of variability is not taken into consideration. Stibbe likewise went on to give the ideal types of his 'Negroid' and the 'Australoid' races. His descriptions of these types are as unreal as are those of his Mongolian type. In spite of all these, almost all anthropologists working on the Indian material have been having these 'archetypes' before their mind, with the result that each skull has been taken singly and compared with one of the hypothetical racial types. If the comparison shows a closeness to a type, the skull has been regarded as belonging to that particular race. If, on the other hand, the resemblance is less exact, the skull has been relegated to a mixed group. It may very often happen that a single skull shows features that belong to two or more hypothetical types; in such cases, the skull has been immediately considered to have been the result of mixture of these races. Sometimes, the most likely 'racial types' have been considered in the skulls from a particular area, so that the conclusions could generally confirm a conventional story of invasion or migration put forward in history. Since the individual variability in physical characteristics is very great, it has not been difficult to find the type suitable in a particular situation from a collection of skeletal material.

When all the skulls have thus been put into the corresponding types, the latter are called 'elements'. If a skull appears to be intermediate between two or three types, it

[1] C. S. Coon, *The Races of Europe* (New York, 1939).
[2] E. P. Stibbe, *An Introduction to Physical Anthropology* (London, 1938).

is explained as a ' mixed type ' consisting of the corresponding ' elements '. One should notice that the size of the sample has been of no importance and the minimum unit of classification has been even one. Further, since no two skulls are absolutely similar to each other at any archaeological site, there will always be two or more elements detectable in any series of skulls; then the group has been assumed to be formed by admixture, but the elements are nevertheless thought to be quite discrete and identifiable. The ultimate resut of all this has been the splitting up of any series of skulls into the so-called 'elements', and their identification is thought to be the prime duty of a worker, because the ' type ' is supposed to be eternal and identifiable in a series of skulls wherever and in whichever historical period they are found.

This appears to have been a satisfactory and unquestionable methodology so far. The chief satisfaction has been that one could dispose of all skulls into a series by relegating them to one or the other type or to a mixed type as the case may be. There has been no loose end to be bothered about. Next, since the number of skulls has not been of much value, extensive reports have been written on even a single skull or even on fragments of a skull. Lastly, since there has been no question of any statistical check on the conclusions, which have always been in agreement with real or supposed archaeological findings; at least, they have not gone counter to the archaeological conclusions. In this way, the archaeologist is also satisfied. There is complete complacence on both sides: the anthropologist does not bother to question the method he uses, and the archaeologist does not take extra pains in recovering more skeletal remains than have been accidentally found. A skull here or a fragment of bone there has been thought to be sufficient to tell of the racial affinities of the ex-owner of the skull or bone.

4. CONCEPTS OF TAXONOMY

It seems to me that such a sense of security and complacence, a self-satisfaction of having achieved the final truth, is a sign of stagnation or decay in any branch of knowledge. And anthropology is no exception to this generalization. It is for this reason that I think that a re-examination of the concepts and methods underlying physical anthropology in India is called for. I shall concern myself with those related to the existing situation or the work on the study of ' racial affinities ' of ancient skeletal material, but it can equally be applied to anthropometrical studies on living subjects, for the methodology for both ought to be the same. The central concept of ' type ' automatically forms the chief subject of our discussion, for the kind of method and conclusions is based on it. As it is, I view the situation as a problem related to classification and taxonomy of living objects, specially those of animals, and consequently I shall discuss ' typology ' as a method of animal-classification and its scientific validity in the light of our present-day knowledge on the bases of such classification.

Life is so bewilderingly varied and comprises such an enormity of number that men from time immemorial have attempted to classify them in one way or another in order to create some degree of order out of the apparent chaos.

We all know that Linnaeus (1707-78) was the first who invented a system of classification which we still use and find very useful. His method of classification consisted of grouping animals by looking at the similarities and dissimilarities among them. This purely morphological method had been used by men before him and was used by all his contemporaries and many of his successors. To his credit goes the fact that for the first time he classified man among the animals, thus striking at quite a novel idea. Animals

in this system are classified from broader to narrower categories and the number of animals included in each category correspondingly decrease. The categories which he invented were Class, Order, Genus and Species. An animal was put in a particular category by the comparison of the common characters between those of the animal and those thought to be 'typical' of the group. Linnaeus and his contemporaries and many of his successors did not try to find out the meaning of these groupings and firmly believed that they had been created as such. The common characters became the hall-mark of a group of animals, the 'archetype'. No consideration was given to the naturally-occurring variation within groups of animals. The result was that if an animal did not conform to the accepted 'archetype', say, a species, a new species had to be created for it. The natural consequence was that a large number of species were soon recognized; they in turn had their own diagnostic characters. Linnaeus did not consider any infra-specific categories for his classifications and considered 'species' as the ultimate unit of classification.

This concept of static and non-variable species gave way to that of a variable species and the concept of changeability of a species. This break in the traditional thinking-process was due to the extensive field-work of both Darwin and Wallace, and the presentation of the theory of evolution by means of natural selection. These authors showed that naturally-occurring variability within a species was a fact of nature and provided the raw material for evolution. On the basis of this discovery scientists considered the Linnaean classification in a new way. They perceived that animals within a group were biologically related and were connected by descent with the next higher groups. It is, however, a paradox that the assignment of place to an animal in this classification continued in the same process as earlier, viz. by individual comparison with the 'type' by means of 'diagnostic characters'; in other words, the concept or 'archetype' was still strongly embedded in the mind of scientists and, through them, of common people. The concept has prevailed among quite a few workers even at present, as for example, the anthropologists to whom I have already referred earlier in connexion with the report on the skeletal material from different sites in India. The 'archetype' here is equated with the 'racial type' in its pristine purity.

However, towards the end of the last century a small group of bird-taxonomists recognized the geographic variations of a species and employed a trinomial system to designate such sub-specific categories. This resulted in a considerable reduction in the number of species, for many 'species' of birds were found to be nothing more than geographic variants and were relegated to sub-species. The concept of polytypic species gradually evolved from such a thinking-process. And in place of the habit of thinking of a species in terms of morphological types there grew up a new concept which was primarily biologic rather than morphologic. This can be seen from its definition given by Mayr as follows: 'Species are groups of actually or potentially inter-breeding natural populations, which are reproductively isolated from other such groups.'[1] On the other hand, a definition of species with the morphological characters basis would run somewhat as follows: 'A species is a group of individuals or populations with the same or similar morphological characters.'[2] It will be seen that most authors of the old school apply a somewhat similar definition as well for 'race' which must be an infra-specific category. Hooton's definition may be set up for an example: 'A race is a great division of mankind, the members of which, though individually varying, are characterized as a group by a

[1] E. Mayr, 'Speciation phenomena in birds', *American Nature*, 74 (1940), pp. 249-78.
[2] E. Mayr, *Systematics and the Origin of Species* (New York, 1947), p. 115.

certain combination of morphological and metrical features, principally non-adaptive, which have been derived from their common descent.'[1] One can see clearly that this definition of race is not materially different from that of species mentioned above (p. 190). In both, any similarity or dissimilarity in morphological characters has been taken as the basis for definition. This kind of definition does not differentiate between a higher-category species from a lower-category one, the sub-species of race, because more or less the same criteria are used for characterizing species, sub-species and even genera. This may result in considerable confusion in taxonomic thinking.

It follows from this discussion that any group defined by morphologic characteristics alone is invalid and is of not much use in scientific taxonomy, for we are not sure where to place a given group in the specific or in the sub-specific category.

5. RACE AND POPULATION

On the other hand, the definition of 'race' given by geneticists of today would appear clearly to differentiate between the species and its sub-division, the sub-species. Sinnot, Dobzhansky and Dunn define 'race' as follows: 'Races are populations that differ in the relative frequencies of gene alleles or of chromosome structure.'[2] This definition presupposes that the populations consist of intermarrying individuals and they are but reproductively isolated in a partial way from other such populations. We can at once see that by the criterion of reproductive isolation we arrive at a clear-cut distinction between the species and its sub-species: the former is reproductively a totally-closed unit, whereas the latter is only partially so. It means also that there is no intergradation of characters between two species due to gene flow; this is probably the rule between two races defined as above.

In addition to being convenient as a method of separating two graded taxonomic units, the genetic definitions of 'species' and 'race' permit us to approach closely the real biological phenomenon of evolution. The reason is that a population which is partially isolated from another is a real and vital entity of a species, since by the development of complete reproductive isolation such a population may develop into a new species, provided complete isolation is maintained, even if at some later time members of the new species come in contact with those of the old parent species. This process of splitting of a species to form new species is, of course, not the only way of speciation; nevertheless, it is certainly an important one.

Further, it is now well-known that micro-evolution or small changes in racial characters as we find among human groups must have resulted primarily from the action of selection, mutation or genetic drift. All these factors of evolution or differentiation act on a particular kind of human grouping only and not on any other kinds. This particular grouping is distinguished from other such groupings by the fact that the members constituting it intermarry among themselves. Groupings of this kind in biology are termed by geneticists as Mendelian populations, or simply as populations. In other words, the evolutionary agencies act on a population-unit, the members of which share a common gene-pool. If we are to study not only the static situation of population-differences in racial characters but also try to answer how the changes have come about, we must

[1] Hooton, *op. cit.*, p. 448.

[2] E. W. Sinnot, T. Dobzhanski and L. C. Dunn, *Principles of Genetics*, 5th ed. (New York, 1958), p. 279.

concentrate our attention on ' population ' as a unit and then examine which factor or factors may have produced the recorded changes. In India, castes and sub-castes may result in the formation of definite populations. Elsewhere, class, religious sects, language, etc., lead to the formation of populations. If race has got any biological meaning, I agree with Sinnot, Dobzhansky and Dunn and prefer to call these populations as races. But such races would obviously be numerous in the present-day world, and naming each would be without much sense.

It would be apparent, however, that this designation of race as a population as used by geneticists is qualitatively different from that used traditionally by anthropologists and laymen alike. It is applied as a concept of the static Linnaean system to groups of individuals irrespective of whether these constitute Mendelian's population or not. The implication is that since these individuals are similar in regard to a particular characteristic, they obviously indicate a close common descent from a hypothetical ancestral group of individuals.

In other words, races are constructed by including individuals inhabiting any part of the world, who show certain degrees of similarities in *constellation of characters*, since the similarity is assumed to be due to the result of being very closely connected by descent. Combinations of characters are held to be inherited as a whole through succeeding generations and hence are thought to be stable. It can be shown that this assumption is wrong from the point of view of genetical knowledge available to us. Stability of a combination of traits is thought to be due either to the effect of pleiotropy or linkage. Bielicki has examined these assumptions and has shown mathematically that association of traits in a type is really spurious. He remarks: ' The frequencies of types in a given population are never in a satisfactory accordance with the Hardy-Weinberg Law, namely, the sum of the square roots of the frequencies of typologically " pure " individuals (i.e. those who are supposed to be homozygous) turns out to be much smaller than the theoretically expected value of 1·00.'[1] Such findings clearly weaken the assumption that pleiotropism produces the stability of ' type '-characters. As regards the assumption of linkage as the basis of the stability, numerous authors have shown that even closely-linked genes eventually become separated by crossing over in a Mendelian population so that the association is lost. Any apparent association is, therefore, not due to the phenomenon of linkage, which is usually investigated in linkages and not in populations.[2] Thus, we find that the concept of ' types ' in a population is not supported by our present knowledge of population-genetics and that the ' types ' are wholly arbitrary in the study of races.

On the other hand, in labelling populations as race, no such assumptions are made. It merely defines populations as breeding groups which differ significantly from another such group. As I have just said, such differences may arise due to several factors acting singly or together. The question of common ancestry or different ancestry for the population is a matter which needs proving in each case. Some authorities go so far as denying the existence of ' race ' in the traditional sense.[3]

The above discussion on the relative value of the two kinds of definition has made it clear, I believe, that race as defined by the genetic method is superior to that made by

[1] T. Bielicki, ' Some possibilities for estimating inter-population relationship on the basis of continuous traits ', *Current Anthropology*, 3, no. 1 (1962), pp. 3-8.

[2] C. Stern, *Principles of Human Genetics* (California, 1950), p. 304.

[3] F. Livingstone, ' On the non-existence of human races ', *Current Anthropology*, 3, no. 3 (1962), pp. 279-80.

the technique of morphology inasmuch as the former attempts to give a true picture of nature, while the latter is wholly artificial. If this is agreed upon, it follows that the human races, viz. Mediterranean, Nordic, Alpine, Armenoid, Proto-Australoid, etc., as defined by the morphologic method, are hardly of any value, since they do not represent any natural groupings but are merely the creation of imagination in the mind of individual taxonomists. The population is, on the other hand, the real entity which alone should be the aim of the study of an anthropologist.

One of the attributes of a population is that its boundary is, in most cases, very vague. This may annoy many taxonomists but cannot be helped. This vagueness is probably the attribute of life itself. However, the individuals who are the units of this grouping are very real. They are the men, women and children interrelated by the fact that they all share a common gene-pool, the relative proportions of the genes in the pool remaining fairly constant from generation to generation, provided certain conditions are fulfilled. In nature, no two individuals are genotypically equal to each other except of course in the case of identical or monozygotic twins. Each individual is unique. Genetically speaking, one may state that most individuals are heterozygous for most of the gene-loci. Moreover, most loci are represented by multiple alleles. All these lead to the existence of permanent variabilities for almost each conceivable character of the body. There is, therefore, no ' type ' in a population. Moreover, it follows from this that since races are populations, a single individual does not constitute a race. A race, therefore, must be described in statistical terms involving the variability found in the population. This is true not only of metrical characters but also of qualitative characters.

A population cannot also be fragmented at the same time keeping the attributes of the population in tact, so that while we find that there are different individuals in a population having one or the other of the four blood-groups, A, O, B, AB, nevertheless the individuals who are A cannot be set aside to form one race as against another consisting of B individuals. Such an effort is clearly unwarranted because then the parents and children might be said to belong to different races—which is quite absurd. If, as is always the case, in a population marriage is contracted irrespective of blood-groups, we shall have no biological justification to break up the population according to blood-groups. We must accept that the population is polymorphic for the different kinds of blood-groups. Furthermore, we must notice that none among these blood-groups is ' typical ' for the population even if the frequency of one of the groups may be the highest there. Thus, a person of group AB which has the least frequency in a population is not in any way less ' typical ' than the person of, say, group B, the frequency of which is usually higher than that of the AB group. As a matter of fact, the question of ' type ' is quite irrelevant here and is not compatible with the concept of population where the real entity is the group instead of the individual. Similarly, one would find variations in stature, head-shape, nose-shape, size of the skull, etc. Some people would be taller than others, some will have broader heads than others, and so on. But in each case, in a population no individual may be said to be typical, and it should be described with respect to the mean value of a particular character and all the variability found in the population for that particular character. A population is what it is—a group of intermarrying individuals—nothing else. It cannot be described by any single *a priori* criterion and no single person, whether real or hypothetical (compounded of all the mean values of metrical characters), represents it.

A type is usually created by the combination of several traits which may be qualitative or quantitative in nature. Obviously, the number of such combinations would depend upon the number of traits chosen arbitrarily. Now, after these combinations

are worked out, a few are chosen from these as being significant as racial elements and the rest rejected as being due to mixture or as otherwise unimportant. These remaining elements are then designated by racial names. This procedure is highly unscientific and certainly pre-Mendelian. It has been shown earlier (above, p. 192) that these combinations or types have no genetic validity. That these types are the result of chance-recombinations of separate traits in a population has been clearly shown by Hunt while analysing the Irish material of Hooton and Dupertius.[1] He has demonstrated by statistical calculations that the types designated by Hooton and Dupertius as races in the Irish population are mostly the result of chance-recombination of single traits. If two traits are very frequent in a population, there will be a considerable number of people having both traits together. Conversely, if two traits are less frequent in a population, comparatively few individuals will carry the traits together. A combination of traits, therefore, is not a fixed unit but is the result of chance-recombination of traits. In so far as they are not permanent units, they cannot be used as racial characters. On the other hand, a population should be characterized by the frequencies of individual characters. Since the morphological characters are present in a population as a continuous series, the distribution of each character necessarily takes the form of a normal curve if plotted on a graph-paper. The mean of this distribution with its standard deviation is the only meaningful constant for the purpose of description of the population. These two basic statistics must also be used for further analysis of the data and for comparison with other samples. In statistical thinking the value of a single specimen, living or dead, is useful in so far as it represents a sample. It is well-known that the value of a sample as representative of the universe increases as the size of the sample is increased, as can be judged from the smaller fluctuations of the standard error in larger samples as compared with smaller samples. It follows, therefore, that in describing a population a large sample is always preferable to a small one, and a sample consisting of only one or two specimens is quite useless to form any opinion on the universe from which the specimen or specimens have come.

6. EXAMINATION OF PREVIOUS CONCLUSIONS

A. Need for re-assessment

In view of the above discussion, we find that the conception of race and the method of its study have both undergone fundamental changes in recent times. We have no option, therefore, but to reject the conclusions based on the older concepts and methods. As we have seen earlier (above, p. 187), these conclusions are wholly confined to the question of 'racial affinities' of the skeletal remains. The skulls were ascribed to the various 'races', viz. 'Mongoloid', 'Proto-Australoid', 'Mediterranean', 'Alpine', and so on. We have shown that these categories do not exist. Therefore, these conclusions become meaningless. Not only that, the concept of 'population' produces far-reaching changes in our thinking-process. We no longer ask questions as to which 'race' a given sample of skull belongs, because the question put in this form has no meaning. We are interested, on the other hand, in knowing what were the probable physical characteristics of a given population as judged from the available samples. We enquire into the probability that the same population is still inhabiting the same locality. If there is any cultural evidence of mixture at a given site, we subject the skeletal sample to heterogeneity-tests to prove whether

[1] E. E. Hunt, Jr., 'Anthrometry, genetics and racial history', *American Anthropologist*, 61 (1959), pp. 64-83.

the people were also of a mixed type. We are no longer satisfied with our visual impression; we try to quantify the observation and examine the frequency of each trait.

For all these analyses we lay special emphasis on the size of the sample for reasons stated earlier (above, p. 194). And all the while we try to understand the basic problem of physical anthropology: what are the factors that cause human variation in time and space. In regard to this problem, theoretical concepts have gone far ahead of empirical data; once the typologic way of thinking is discarded, we shall each find before us almost a virgin field for enquiry, which has hardly been explored as yet.

After discarding the typologic method from racial analysis, we are now to see what result we obtain from subjecting the data to the well-known statistical methods. As an illustration of this method as applied to the prehistoric remains in India, I choose samples from three places in the north and west. They are the celebrated cities of Harappa, Mohenjo-daro and Lothal. These sites are dated fairly accurately and represent a homogenous Bronze Age culture.

B. Harappa

The material from Harappa is the largest sample yet available to us. As has been stated earlier (above, p. 185), it came from two cultural strata. A total of twentytwo skulls was derived from R 37, a cemetery of the mature form of the Harappa culture; of them fourteen belong to male and eight to female individuals. The later Cemetery H produced twentythree skulls, eight male and fifteen female.

In comparing two populations it is necessary to start with the hypothesis that no differences exist between them and then test this hypothesis. A hypothesis that differences do exist is not specific, and hence cannot form the basis of a test. The typologic method is of the latter category where it is taken for granted that *different* types exist in a population. Then there will be no other alternative but to look for the ' types ' and eventually to find what is wanted. I have, therefore, assumed that no difference exists between the skulls from the two cultures at Harappa. The total number of skulls then comes to fortyfive, of which twentytwo belong to male and twentythree to female individuals.

Before proceeding to the analysis of the data, I must state the limits we have to recognize here on account of the smallness of the present sample. In data of this kind which are the results of chance-finds from the excavation of prehistoric sites, we have to work on the basis of two assumptions. The first is that the population comprising the entire Harappa city and its environs constituted a homogeneous population. Only with this assumption can we treat the sample as representing the entire population. In reality, the fact might be otherwise. There might have been large endogamous groups differing markedly in physical characteristics with one another. We do not know anything about it and we do not know further whether the sample belonged to one such population or to many. In assuming the homogeneity of the entire population we ignore this very likely situation.

The second assumption that we have to make is that the individuals in the sample have been chosen in a random manner from the population. Even if we assume that the population was homogeneous, a biased sample will result if only a selected part of the population may have been sampled. For example, if it so happens that only those skeletons survive the passage of time and the pressure of the superimposed deposit which are relatively stouter than those which did not survive the ravages of time, then stouter individuals will be found in greater numbers in our sample at the expense of leaner individuals, thereby introducing a certain amount of bias in the sample, which will no longer represent the total population. Although we do not know whether such was

actually the case in the present sample, it can be shown whether any given sample is a random one by a suitable statistical test. But for the test we require a large enough sample of over two hundred individuals; a small sample will not give any conclusive result for the test. We cannot, therefore, test it here, and this introduces a degree of uncertainly in the interpretation of the data. We thus find that the two assumptions we have made are important ones and together make the data considerably less reliable than if we had collected the sample from a living population where these assumptions are not necessary. But perhaps we cannot help it with archaeological material where very little is known about the population for most of the time. Nevertheless, we are to keep in mind these limitations while analysing or interpreting data.

With these preliminary observations, I now proceed to analyse the data. As I have said earlier, we have pooled the two samples from the two stratified cultures, namely R 37 and Cemetery H, on the hypothesis that these belong to the same population. One way of testing it is to show whether there is internal consistency between the males and females of the population by comparing their variances for each character. For this I have adopted the familiar critical ratio test[1], which is the ratio of the difference between the two corresponding constants to the standard error of the difference and it may be regarded as significant when its value is greater than 2. It is seen from Table I that the

TABLE I

CRITICAL RATIOS—HARAPPA MALE : FEMALE

No.	Characters	Male C.V. ±S.E.	Female C.V. ±S.E.	Critical ratio
1	Maximum cranial length	2·41±0·36	3·81±0·50	0·23
2	Maximum cranial breadth	3·99±0·63	4·33±0·62	0·38
3	Basion-bregma height	2·82±0·45	4·78±0·71	2·33
4	Minimum frontal breadth	3·35±0·54	4·61±0·62	1·53
5	Vertical portion height	2·74±0·48	4·43±0·65	2·09
6	Horizontal circumference	2·48±0·41	3·72±0·54	1·83
7	Nasion-prosthion line	6·00±0·93	7·55±1·11	1·07
8	Bizygomatic breadth	4·43±0·99	3·47±0·68	0·80
9	Nasal height	5·83±0·88	7·72±1·00	1·42
10	Nasal breadth	8·51±1·31	7·32±0·96	0·73
11	Orbital breadth (left)	5·38±0·87	5·79±0·80	0·35
12	Orbital height (left)	8·04±1·27	7·28±1·05	0·46
13	Palatal length	7·05±1·18	7·30±1·22	0·15
14	Palatal breadth	9·85±1·60	6·46±1·14	1·73
15	Bigonial breadth	10·29±2·02	7·40±1·85	1·05
16	Bicondylar breadth	9·40±2·22	—	—
17	Mandibular breadth	7·31±1·38	7·82±1·53	0·25
18	Length-breadth index	5·15±0·84	5·39±0·79	0·21
19	Breadth-height index	4·75±0·79	5·34±0·87	0·50
20	Superior facial index	9·24±2·07	5·52±1·23	1·54
21	Orbital index (left)	8·84±1·44	7·76±1·14	0·59
22	Nasal index	8·86±1·40	11·61±1·55	1·32
23	Palatal index	11·83±2·09	9·54±1·74	0·84
24	Mandibular index	14·67±3·46	—	—

*Values are statistically significant at 5% level as they are greater than or equal to 2.

[1] R. K. Mukherjee, C. R. Rao and J. C. Trevour, *The Ancient Inhabitants of Jebel Moya (Sudan)* (Cambridge, 1955), p. 60.

female series is somewhat more variable than the male, but the differences are significant in only two out of twentytwo characters, which are in basion-bregma height and vertical portion height, that is, mainly in the head-height. But in the breadth-height index the difference is not statistically significant. The values are also more or less of the same order. From this comparison we can be reasonably confident that the males and females might have been taken from the same population. In other words, the series can be taken to be reasonably homogeneous. A comparison of both the male and female series of Harappa has next been made with a known series the homogeneity of which is beyond dispute. Such a series is designated as Egyptian E from Giza.[1]

In the comparison between the Harappa male and Egyptian male (Table II), out of twentyone characters taken for comparison, the values of only four characters of the

TABLE II

CRITICAL RATIOS—HARAPPA MALE : EGYPTIAN MALE

No.	Characters	Harappa C.V. ±S.E.	Egyptian C.V. ±S.E.	Critical ratio
1	Maximum cranial length	2·41 ±0·36	3·09 ±0·07	1·85
2	Maximum cranial breadth	3·99 ±0·63	3·43 ±0·09	0·88
3	Basion-bregma height	2·82 ±0·45	3·75 ±0·09	2·03*
4	Minimum frontal breadth	3·35 ±0·54	4·28 ±0·10	1·69
5	Vertical portion height	2·74 ±0·48	3·63 ±0·06	1·84
6	Horizontal circumference	2·48 ±0·41	2·65 ±0·06	0·41
7	Nasion-prosthion line	6·00 ±0·93	—	—
8	Bizygomatic breadth	4·43 ±0·99	3·55 ±0·06	0·89
9	Nasal height	5·83 ±0·88	5·65 ±0·09	0·20
10	Nasal breadth	8·51 ±1·31	4·90 ±0·12	2·73*
11	Orbital breadth (left)	5·38 ±0·87	4·06 ±0·07	1·51
12	Orbital height (left)	8·04 ±1·27	5·56 ±0·14	1·94
13	Palatal length	7·05 ±1·18	6·70 ±0·11	0·30
14	Palatal breadth	9·85 ±1·60	6·78 ±0·18	1·91
15	Bigonial breadth	10·29 ±2·02	6·80 ±0·32	1·71
16	Bicondylar breadth	9·40 ±2·22	4·72 ±0·16	2·23*
17	Mandibular breadth..	7·31 ±1·38	4·74 ±0·24	1·84
18	Length-breadth index	5·15 ±0·84	3·57 ±0·06	1·88
19	Breadth-height index	4·75 ±0·79	4·14 ±0·07	0·77
20	Superior facial index	9·24 ±2·07	—	—
21	Orbital index (left)	8·84 ±1·44	5·96 ±0·10	2·00*
22	Nasal index	8·86 ±1·40	8·08 ±0·13	1·40
23	Palatal index	11·83 ±2·09	8·67 ±0·16	2·09*
24	Mandibular index	14·67 ±3·46	—	—

*Values are statistically significant at 5% level as it is greater than or equal to 2.

[1] K. Pearson and A. G. Davin, 'On the biometric constants of the human skull', *Biometrika*, 16 (1924), pp. 328-63; E. S. Martin, 'A study of an Egyptian series of mandibles, with special reference to mathematical methods of sexing', *ibid.*, 28 (1936), pp. 149-78.

Harappa series are found to be significantly larger than those of the Egyptian series and in one instance, that of basion-bregma height, it is smaller. In the rest of the characters, there is no significant difference in the coefficient of variability. We thus observe that the variability of the Egyptian series is very similar to that of the Harappa series in the majority of the characters.

Analysing in the same way we find that the majority of the characters of the Harappa female series (Table III) show substantial agreement with the Egyptian series of the corresponding sex.

TABLE III

CRITICAL RATIOS—HARAPPA FEMALE: EGYPTIAN FEMALE

No.	Characters	Harappa C.V.±S.E.	Egyptian C.V.±S.E.	Critical ratio
1	Maximum cranial length	3·81±0·50	2·66±0·07	2·28*
2	Maximum cranial breadth	4·33±0·62	3·34±0·10	1·58
3	Basion-bregma height	4·78±0·71	3·39±0·70	1·95
4	Minimum frontal breadth	4·61±0·62	4·11±0·12	0·79
5	Vertical porion height	4·43±0·65	3·32±0·07	1·70
6	Horizontal circumference	3·72±0·54	2·35±0·07	2·51*
7	Nasion-prosthion line	7·55±1·11	—	—
8	Bizygomatic breadth	3·47±0·68	3·62±0·08	0·22
9	Nasal height	7·72±1·00	5·31±0·10	2·41*
10	Nasal breadth	7·32±0·96	6·96±0·21	0·37
11	Orbital breadth (left)	5·79±0·80	3·97±0·08	2·26*
12	Orbital height (left)	7·28±1·05	5·62±0·11	1·58
13	Palatal length	7·30±1·22	6·26±0·13	0·85
14	Palatal breadth	6·46±1·14	6·83±0·15	0·32
15	Bigonial breadth	7·40±1·85	6·68±0·40	0·38
16	Bicondylar breadth	—	—	—
17	Mandibular breadth	7·82±1·53	4·32±0·18	2·27*
18	Length-breadth index	5·39±0·79	3·34±0·07	2·59*
19	Breadth-height index	5·34±0·87	3·88±0·08	1·67
20	Superior facial index	5·52±1·23	—	—
21	Orbital index (left)	7·76±1·14	5·47±0·11	2·01*
22	Nasal index	11·61±1·55	7·90±0·16	2·41*
23	Palatal index	9·54±1·74	8·40±0·19	0·65
24	Mandibular index	—	—	—

*Values are statistically significant at 5% level as they are greater than or equal to 2.

These comparisons will show that our sample may be considered as reasonably homogeneous, though less so than the Egyptian E sample. This would imply that our 'null' hypothesis has not been seriously disproved and the samples from the two cultures, R 37 and Cemetery H, can be held as not essentially different from each other.

The same conclusion of close identity between the populations represented in R 37 and in Cemetery H can clearly be drawn from a comparison of their mean values. Table IV compares the mean values of the male series, while Table V compares those of the female series. It is seen that the overwhelming majority of the mean values of the male

TABLE IV

COMPARATIVE TABLE OF HARAPPA R 37 (MALE) AND CEMETERY H (MALE)

No	Characters	R 37				Cemetery H			
		N	Mean ± S.E.	S.D.	C.V.	N	Mean ± S.E.	S.D.	C.V.
1	Maximum cranial length	13	187·54 ± 1·09	3·93	2·10	8	188·44 ± 2·05	5·79	3·07
2	Maximum cranial breadth	14	133·32 ± 0·83	3·11	2·33	6	141·33 ± 2·54	6·22	4·40
3	Basion-bregma height ..	12	133·79 ± 1·39	4·81	3·60	7	134·86 ± 0·59	1·57	1·16
4	Minimum frontal breadth	12	95·17 ± 0·84	2·89	3·04	6	96·08 ± 1·29	3·17	3·30
5	Horizontal circumference	11	520·00 ± 2·99	9·93	1·91	6	533·00 ± 4·97	12·17	2·28
6	Nasion-prosthion line ..	12	70·62 ± 1·20	4·15	5·88	7	68·93 ± 1·84	4·87	7·07
7	Nasal height ..	12	51·96 ± 0·90	3·11	5·99	8	51·75 ± 1·07	3·03	5·86
8	Nasal breadth ..	11	26·68 ± 0·74	2·45	9·18	8	25·88 ± 0·80	2·25	8·69
9	Orbital breadth (left) ..	11	42·36 ± 0·57	1·90	4·49	6	41·00 ± 1·05	2·57	6·27
10	Orbital height (left) ..	12	33·92 ± 0·70	2·43	7·16	6	33·58 ± 0·87	2·13	6·34
11	Palatal length ..	10	48·40 ± 1·20	3·78	7·81	7	46·14 ± 0·95	2·53	5·48
12	Palatal breadth ..	10	39·40 ± 1·01	3·20	8·12	8	39·31 ± 1·59	4·49	11·42

TABLE V

COMPARATIVE TABLE OF HARAPPA R 37 (FEMALE) AND CEMETERY H (FEMALE)

No.	Characters	R 37				Cemetery H			
		N	Mean ± S.E.	S.D.	C.V.	N	Mean ± S.E.	S.D.	C.V.
1	Maximum cranial length	14	179·68 ± 1·91	7·16	3·98	15	178·30 ± 1·73	6·68	3·75
2	Maximum cranial breadth	12	130·67 ± 1·50	5·20	3·98	12	131·92 ± 1·52	5·27	3·99
3	Basion-bregma height ..	10	127·60 ± 1·10	3·47	2·72	13	127·58 ± 2·13	7·70	6·04
4	Minimum frontal breadth	15	93·10 ± 0·80	3·08	3·31	12	92·21 ± 1·41	4·87	5·28
5	Horizontal circumference	12	502·42 ± 3·33	11·52	2·29	12	500·83 ± 6·84	23·68	4·73
6	Nasion-prosthion line ..	14	65·11 ± 0·94	3·52	5·41	9	61·56 ± 1·97	5·90	9·58
7	Nasal height ..	17	47·97 ± 0·70	2·89	6·02	13	46·04 ± 1·19	4·31	9·36
8	Nasal breadth ..	17	24·82 ± 0·41	1·70	6·85	12	24·58 ± 0·58	2·01	8·18
9	Orbital breadth (left) ..	14	40·75 ± 0·58	2·17	5·33	12	39·62 ± 0·71	2·45	6·18
10	Orbital height (left) ..	15	33·97 ± 0·53	2·06	6·06	9	32·44 ± 0·94	2·82	8·69
11	Palatal length ..	11	44·56 ± 0·95	3·17	7·11	7	43·79 ± 1·32	3·51	8·02
12	Palatal breadth ..	11	39·82 ± 0·26	0·87	2·18	5	35·20 ± 0·75	1·68	4·77

series are similar with the exception of head-breadth and circumference of the head, but since the latter dimension is influenced by the former, we have actually only one character out of eleven characters in which the mean values differ significantly. This is indeed a very small overall difference between the samples. Even this small overall difference is obliterated in the female series where all the mean values, without any exception, are similar. So the pooling together of the series of R 37 and of Cemetery H appears to be justified.

This, however, does not mean that the people represented by skeletons at Cemetery H could not have been different from those represented by the R 37 skeletons. The comparisons have merely shown that evidence is lacking for demonstrating such differences. It is probable that if the number of specimens are increased, i.e., if the sample-sizes become larger after more finds at the sites, evidences for such differences may be forthcoming. It is a pity that the size of the sample is small, since the two cultures show clear differences.

After we have shown the homogeneity of the sample, we can now utilize the mean values for describing the population (Tables VI and VII). Description is facilitated by

TABLE VI

STATISTICAL CONSTANTS OF POPULATION OF HARAPPA—ADULT MALE

No.	CHARACTERS	N	Mean ±S.E.	S.D. ±S.E.	C.V. ±S.E.
1	Maximum cranial length	22	188·00 ±0·97	4·53 ±0·68	2·41 ±0·36
2	Maximum cranial breadth	20	135·68 ±1·21	5·41 ±0·86	3·99 ±0·63
3	Basion-bregma height	20	136·50 ±0·86	3·85 ±0·61	2·82 ±0·45
4	Minimum frontal breadth	19	95·82 ±0·74	3·21 ±0·52	3·35 ±0·54
5	Vertical portion height	16	116·06 ±0·80	3·18 ±0·56	2·74 ±0·48
6	Horizontal circumference	18	525·89 ±3·08	13·06 ±2·18	2·48 ±0·41
7	Nasion-prosthion line	21	69·83 ±0·91	4·19 ±0·65	6·00 ±0·93
8	Bizygomatic breadth	10	133·15 ±1·87	5·90 ±1·32	4·43 ±0·99
9	Nasal height	22	52·16 ±0·65	3·04 ±0·46	5·83 ±0·88
10	Nasal breadth	21	26·31 ±0·49	2·24 ±0·35	8·51 ±1·31
11	Orbital breadth (left)	19	42·16 ±0·52	2·27 ±0·37	5·38 ±0·87
12	Orbital height (left)	20	34·32 ±0·62	2·76 ±0·56	8·04 ±1·27
13	Palatal length	18	47·39 ±0·79	3·34 ±0·56	7·05 ±1·18
14	Palatal breadth	19	39·71 ±0·90	3·91 ±0·63	9·85 ±1·60
15	Bigonial breadth	13	88·85 ±2·53	9·14 ±1·79	10·29 ±2·02
16	Bicondylar breadth	9	118·67 ±3·72	11·15 ±2·63	9·40 ±2·22
17	Mandibular length	14	82·32 ±1·61	6·02 ±1·14	7·31 ±1·38
18	Length-breadth index	19	72·60 ±0·86	3·74 ±0·61	5·15 ±0·84
19	Breadth-height index	18	98·35 ±1·10	4·67 ±0·78	4·75 ±0·79
20	Superior facial index	10	51·21 ±1·50	4·73 ±1·06	9·24 ±2·07
21	Orbital index (left)	19	81·67 ±1·66	7·22 ±1·17	8·84 ±1·44
22	Nasal index	20	50·25 ±1·00	4·45 ±0·70	8·86 ±1·40
23	Palatal index	16	82·42 ±2·44	9·75 ±1·72	11·83 ±2·09
24	Mandibular index	9	69·87 ±3·42	10·25 ±2·42	14·67 ±3·46

TABLE VII

STATISTICAL CONSTANTS OF POPULATION OF HARAPPA—ADULT FEMALE

No.	CHARACTERS	N	Mean ± S.E.	S.D. ± S.E.	C.V. ± S.E.
1	Maximum cranial length	29	178·97 ± 1·27	6·82 ± 0·90	3·81 ± 0·50
2	Maximum cranial breadth	24	131·29 ± 1·16	5·69 ± 0·82	4·33 ± 0·62
3	Basion-bregma height	23	127·59 ± 1·27	6·10 ± 0·90	4·78 ± 0·71
4	Minimum frontal breadth	28	92·36 ± 0·81	4·26 ± 0·57	4·61 ± 0·62
5	Vertical portion height	23	110·07 ± 1·02	4·88 ± 0·72	4·43 ± 0·65
6	Horizontal circumference	24	501·62 ± 3·80	18·64 ± 2·69	3·72 ± 0·54
7	Nasion-prosthion line	23	63·72 ± 1·00	4·81 ± 0·71	7·55 ± 1·11
8	Bizygomatic breadth	13	122·54 ± 1·18	4·25 ± 0·83	3·47 ± 0·68
9	Nasal height	30	47·13 ± 0·66	3·64 ± 0·47	7·72 ± 1·00
10	Nasal breadth	29	24·72 ± 0·34	1·81 ± 0·24	7·32 ± 0·96
11	Orbital breadth (left)	26	40·23 ± 0·46	2·33 ± 0·32	5·79 ± 0·80
12	Orbital height (left)	24	33·40 ± 0·50	2·43 ± 0·35	7·28 ± 1·05
13	Palatal length	18	44·25 ± 0·76	3·23 ± 0·54	7·30 ± 1·22
14	Palatal breadth	16	38·38 ± 0·62	2·48 ± 0·44	6·46 ± 1·14
15	Bigonial breadth	8	81·19 ± 2·12	6·01 ± 1·50	7·40 ± 1·85
16	Bicondylar breadth	4	—	—	—
17	Mandibular length	13	76·88 ± 1·66	6·01 ± 1·18	7·82 ± 1·53
18	Lenght-breadth index	23	74·17 ± 0·83	4·00 ± 0·59	5·39 ± 0·79
19	Breadth-height index	19	98·72 ± 1·21	5·27 ± 0·86	5·34 ± 0·87
20	Superior facial index	10	52·01 ± 0·91	2·87 ± 0·64	5·52 ± 1·23
21	Orbital index (left)	23	82·72 ± 1·34	6·42 ± 0·95	7·76 ± 1·14
22	Nasal index	28	52·97 ± 1·16	6·15 ± 0·82	11·61 ± 1·55
23	Palatal index	15	86·48 ± 2·13	8·25 ± 1·51	9·54 ± 1·74
24	Mandibular index	4	—	—	—

C.V. = coefficient of variation; S.D. = standard deviation; S.E. = standard error.

taking the indices into consideration because these refer to the shape of particular parts of the body.

In considering the mean values as describing a sample we must take into account their standard errors also. The latter give indications as to the extent to which the sample means approach the true means of the population. It is known that the smaller the standard error of the mean, the more accurately do we estimate the true mean of the population. It is held that the true mean lies in ninetyfive per cent of cases in an area covered by twice the standard error on either side of the true mean.

The range of the values of the two indices mentioned above and of those of many other indices have been arbitrarily broken up into categories and have been suitably named. This categorization of indices is very convenient for description of a sample or of an individual. The mere mention of the index-values may not always appear to register the significance in the mind of the readers.

According to our figures the cranial indices for both males ($72 \cdot 60 \pm 0 \cdot 86$) and females ($74 \cdot 17 \pm 0 \cdot 83$) indicate dolichocephaly or long-headedness, but females appear to be less so than the males. Now, let us consider how the standard error affects these values. It will be seen that for males the true mean may lie anywhere between 70·88 and 74·32, and for females between 72·51 and 75·83. While both values of males lie within the dolichocephal category, the higher value for the females finds itself in the mesocephal category. So that, for males we can be reasonably certain that the population might have been dolichocephalic but for the females we are not so sure: similar sample from the same population may show a mean denoting mesocephaly.

The breadth-height index of the skull-vault for females is $98 \cdot 72 \pm 1 \cdot 21$. The means indicate acrocephaly or high-domed skulls for both males and females. However, judging from the standard errors for both sexes, the true means could as well be in the next lower metriocranial category. In this case, we are not certain whether the population had actually high-domed or medium-high-domed variety of skulls.

In the facial region, the shape of the upper face will be considered now. The index is calculated by the formula 100 × upper facial height/bizygomatic breadth. As indicated by the means of the two sexes (male = $51 \cdot 21 \pm 1 \cdot 50$; female = $52 \cdot 01 \pm 0 \cdot 91$), we find that both of them have medium face, neither long nor particularly short. The two sexes do not differ in this respect. The standard error for males is fairly high, so that the true mean for the population fluctuates between the limits 48·21 and 54·21. Thus, the true mean might also have been in the euryn or short-faced category. We are not sure. As regards females, the true mean fluctuates between 50·19 and 53·83, both being in the medium category.

The orbital index (100 × height of left orbit/breadth of the same) of both males and females have medium-high orbits ($81 \cdot 67 \pm 1 \cdot 66$; $82 \cdot 72 \pm 1 \cdot 34$). The true means for both sexes, however, lie within this category, and the next higher one, hypsiconch or high face. Therefore, for descriptive purposes, the true nature of the sexes in this respect is uncertain, but probably the orbits were not low or chamaeconch.

We next consider the nasal index, 100 × maximum breadth of nasal aperture/nasion to sub-nasion length; male = $50 \cdot 25 \pm 1 \cdot 00$, female = $52 \cdot 97 \pm 1 \cdot 16$). The mean nasal index of males belongs to the upper limit of the mesorrhine or medium-broad category, and that of females to the chamaerrhine category. But the standard error in males is such that it is difficult to gauge the nose-shape of the population; for it might be broad-nosed as well (48·25 to 52·25). Females, however, show that though the true mean fluctuates between 50·65 and 55·29, both these are in the broad-nosed category. Therefore, the females may probably be classified as such.

The palatal indices (100 × breadth of the palate/length of the palate) for males ($82 \cdot 42 \pm 2 \cdot 44$) and for females ($86 \cdot 48 \pm 2 \cdot 13$) show that the former had mesostaphylin (medium-broad) palate, while females had brachystaphylin (broad) palate. But the standard errors for both sexes are so large that the true means for either sex fluctuate widely. Thus, for males the true means fluctuate between 77·54 (narrow) and 87·30 (broad), while for females the fluctuation is between 82·22 (medium-broad) and 90·74 (broad). In this case, it is evident that it would be futile to say anything about the shape of the palate of the population.

From this very brief analysis of a few selected traits which are generally employed by the anthropologists for racial analysis, we no doubt obtain some idea of the sample represented by the skeletons found at Harappa. Thus, judging from the above means we find that the Harappans were long-headed and high-domed groups, the sexes not

differing markedly in these characteristics. They had medium-high faces and orbits of medium dimensions. While the population was markedly broad-nosed as a whole, the females of the series show relatively more flattened noses than their male counterparts. The palates of both sexes were broad generally, with the females registering a somewhat broader aspects than those of males.

Consideration of the values of variance forces us to admit that the population was reasonably homogeneous, and females formed part of the population. Furthermore, since there is no marked heterogeneity in the material at our disposal, the hypothesis that the group is formed by more than one discrete population must be held as not proved. Under the circumstances, to postulate several racial stocks or elements going into the formation of the Harappans should be considered as presumptuous and the result perhaps of wishful thinking, and not as a statement based on scientific reasonings.

C. Mohenjo-daro

Let us now take up the skeletal remains from Mohenjo-daro, a Harappan site situated some 500 km. south of Harappa down the river Indus. It will be recalled that Colonel Seymour Sewell and Dr. B. S. Guha, who worked on these bones, postulated that the population constituted of four racial stocks (above, p. 181). This evidently means that the population was highly heterogeneous. Now, when we come to examine the evidence of such statement, we observe that it was based on thirteen skulls, five of them belonging to females and seven to males, all adults, and the remaining one to that of a child, which we should discard in our analysis following the usual practice in racial studies. The skulls were in varying degrees of distortion and intactness. Consequently, the authors reported the cephalic indices of only five male and three female skulls. It is to be noted that they considered the values on two male and two female skulls as of doubtful nature. In the fitness of things we should have rejected those skulls, but the number of skulls being so small, we are forced to take them tentatively.

The sample-size is so small that we can in no way study the heterogeneity of the group. The mean cephalic indices come to 72·60 for the males and 65·66 for three female skulls. Evidently, the population had dolichocephalic or long heads.

In regard to the nasal index denoting nose-shape, we have the mean values 51·71 for four male and 46·93 for five female skulls. These values relegate the skulls to roughly the medium-nosed category, although the female skulls register somewhat narrower noses than their male counterparts.

The mean height-width index of the face *minus* the jaw of three skulls is 51·7, denoting a face neither too narrow nor too short. The value of one female skull is given as 54·46, also of the same type as those of the males.

The orbital index of five male and five female skulls respectively is 86·84 and 88·38, indicating high orbits for both the sexes.

The authors give the estimated heights of four male and three female skeletons; the means come respectively to 175·5 cm. and 144·3 cm. These estimations are made according to Pearson's method. From these figures we find that the mean male-height indicates tall individuals, but the sex-difference appears to be substantial. Individual skeletons in both sexes also vary widely from each other. This result may probably be due to the smallness of the sample and also to the fact that coefficient of correlation calculated on European skeletons have been applied to this material, in which the coefficient values are not known.

D. Lothal

Finally, we consider the skeletons excavated from Lothal, a third Harappan site, this time in Gujarat. Here the skulls and other bones are so distorted and broken, and with so many missing parts, that we shall confine ourselves to the cephalic and nasal indices.

Dr. S. S. Sarkar identified all the skulls (above, p. 186) as belonging to the males. There are altogether nine skulls upon which cephalic indices should be calculated. One of them belongs to a child, which is discarded for our analysis. Of the remaining male skulls, almost all bear query-marks. However, the mean cephalic index of the group comes to 79·68. We observe that when compared with the males from Harappa and Mohenjo-daro it is a definitely higher value bordering on broad-headedness.

As regards the shape of the nose, Sarkar gives the following values, all of doubtful nature, of three skulls; 57·47, 44·00 and 59·00. The mean of these values comes to 53·52, a value which decidedly puts the skulls in the chamaerrhine or broad-nosed clan.

According to Sarkar's calculation, the mean stature of five individuals is 172·1 cm., indicating a fairly tall group.

E. General observations

The above descriptions of the three skeletal populations lead us to form some opinion of the characteristics of the respective populations. Two generalizations seem to be legitimate in this context. The first is that the populations at Harappa, Mohenjo-daro and Lothal possessed rather broad noses. And the second is that the population at Lothal had, relative to those at the two other sites, broader heads. The proper interpretation of these facts depends primarily upon the basic data, i.e., the measurements made on the skulls. From the reports we find that most measurements were made on distorted and broken skulls. This is the most important contributory factor of the wide variations that we notice in the skulls of the small samples at our disposal. For example, the cephalic indices of the seven skulls from Lothal vary between 66·51 and 91·86, that is, between extreme dolichocephaly and extreme brachycephaly. This degree of variation is not to be expected in any sample of a very small size and must be due to the distortion of the skulls.

Meanwhile, the most concrete fact that has emerged from our studies of the Harappan skeletal material is that at each of these sites the population was homogeneous with regard, at least, to head-shape, nose-shape and stature. This would mean that whatever their original composition might have been, the populations at these sites belonged each to a single biological group and not recognizable as belonging to several races with distinctive characteristics. Secondly, this population was broad-nosed or chamaerrhine, tall and long-headed in Panjab and Sind and with somewhat rounder heads in Gujarat.

We must separate the issue of the origin of the Harappan peoples from the question of the origin of the Harappa culture. We should also take into account the physical variation of the people of Harappa culture in the north and in the south as in Gujarat. As we have seen earlier, the skulls in the north were dolichocephalic, whereas they were meso-brachycephalic in the south. If we assume that the culture was brought to India from elsewhere physically by a horde of people, we must necessarily conclude that the broad-headed among them selectively moved to the south while the long-headed people chose to stay in the north. This is palpably absurd because migration never occurs on the basis

of head-shape. Alternatively, we have to assume two centres of the origin of the people both having identical cultures, one carried by people with broad heads, and the other by those with long heads. As yet archaeologists have not pointed out such twin sources. From the point of view of an anthropologist, it seems to me that at least an equally plausible hypothesis to put forward is that the populations in India during the Harappan times descended from earlier populations in the same regions. This would explain the difference in the head-shape between the northern and the southern branches, being due to regional variations as at present.

The question of autochthonous origin of the culture in north-west India must be taken into account. The recent discovery at Kalibangan where the Archaeological Survey of India has found 'a full-blooded Harappa settlement overlaying the remains of an earlier culture' is significant in this context. This earlier culture is under investigation, and Ghosh believes that it may prove to have contributed to the origins and make-up of the Harappa culture.[1] Under the circumstances, skeletal finds at Kalibangan would be of immense interest in the tracing of physical development in India in the mid-second century B.C. I would like to insist that if we have to make a hypothesis at this stage on the origin of the Harappan populations, it is safer to assume that they originated in the local soil rather than to bring them from thousands of miles away.

7. CONCLUSION

Ancient skeletons almost wholly come from the digging of archaeologists, and I take this opportunity of appealing to them not to equate a skull with a potsherd. A single potsherd may point out the direction of migration of a culture and establish theories of cultural connexion with people inhabiting far-away places. This is because the designs of the colour-combinations on a single potsherd is the reflection of an idea, of a norm, which a people consciously tries to maintain for generations. Each potsherd is a type, only slightly deviating, if it does, from the norm. A single skull, on the other hand, or a piece of jaw-bone, or of any other bone, exists on a different level. Here there is no idea, no archetype, and since the inherent variation in life is enormous, a single skull is of no meaning to us as a sample representing a population. The need of an anthropologist, therefore, is a large sample. Admittedly, this is a tall order, requiring considerable effort; but the result, I believe, will amply justify such an effort in the long run.

[*Received on the 2nd November, 1965.—Ed.*]

[1] A. Ghosh, 'Archaeology in India', *Expedition*, VI, no. 3 (1964), p. 16.